

What is claimed is:

1. A dispersion compensator comprising:

an angular dispersion element for changing an angle of a light which is ejected from an optical transfer element according to a wavelength in the ejected light;

a diffracting optical element having at least a concave reflecting surface so as to diffract the ejected light; and

a reflecting mirror having a reflecting surface which is disposed near a focal point in an entire optical system of which surface shape of the reflecting mirror changes in a dispersing direction of the ejected light according the wavelength in the ejected light.

2. A dispersion compensator comprising:

an angular dispersion element for changing an angle of a light which is ejected from an optical transfer element according to a wavelength in the ejected light;

an optical element having a light-condensing function;

a diffracting optical element having at least a concave reflecting surface so as to diffract the ejected light; and

a reflecting mirror having a reflecting surface which is disposed near a focal point in an entire optical system of which surface shape of the reflecting mirror changes in a dispersing direction of the ejected light according the wavelength in the ejected light.

3. A dispersion compensator according to Claim 2 wherein the focal point in which an image is focused by the optical element and the reflecting surface of the reflecting mirror are disposed on a circumference which is formed according to a radius of curvature in the

concave reflecting surface in the diffracting optical element.

4. A dispersion compensator comprising:

an angular dispersion element for changing an angle of a light which is ejected from an optical transfer element according to a wavelength in the ejected light;

an optical element having a light-condensing function;

an optical deflecting device for deflecting a light which is ejected from the optical element near a focal point in which the light which is ejected from the optical element is focused;

a diffracting optical element having at least a concave reflecting surface so as to diffract the ejected light; and

a reflecting mirror having a reflecting surface which is disposed near a focal point in an entire optical system of which surface shape of the reflecting mirror changes in a dispersing direction of the ejected light according the wavelength in the ejected light.

5. A dispersion compensator according to Claim 4 wherein the reflecting surface on the optical deflecting device and the reflecting surface on the reflecting mirror are disposed on a circumference which is formed according to a radius of curvature in the concave reflecting surface in the diffracting optical element.

6. A dispersion compensator according to Claim 1 wherein:

the diffracting optical element is a concave-surfaced diffracting grating, and

a grating pitch in the concave-surfaced diffracting grating differs according to an area on a concave-surfaced reflecting surface.

7. A dispersion compensator according to Claim 6 wherein the grating pitch in the concave-surfaced diffracting grating differs according to an area in a direction orthogonal to a direction of chromatic dispersion by the angular dispersion element which is disposed on the concave reflecting surface.
8. A dispersion compensator according to Claim 1 wherein:
  - the diffracting optical element is a concave-surfaced diffracting grating; and
  - the diffracting grating is provided with a blaze angle.
9. A dispersion compensator according to Claim 2 wherein the focal point in which an image is focused by the optical element and the reflecting surface of the reflecting mirror are movable such that the focal point in which an image is focused by the optical element and the reflecting surface of the reflecting mirror maintain such a relationship to be disposed on a circumference which is formed according to a radius of curvature in the concave reflecting surface in the diffracting optical element.
10. A dispersion compensator according to Claim 9 wherein the diffracting optical element can be rotated around a fulcrum which is disposed in a center of a curvature in the reflecting surface of the diffracting optical element.
11. A dispersion compensator according to Claim 1 wherein the reflecting surface on the reflecting mirror has a power at least in a plane orthogonal to a direction of chromatic dispersion by the angular dispersion element.

12. A dispersion compensator according to Claim 1 wherein the reflecting surface on the reflecting mirror has a power at least in a plane which includes a direction of chromatic dispersion by the angular dispersion element.

13. A dispersion compensator according to Claim 1 wherein the reflecting surface on the reflecting mirror is formed in rotatively an asymmetrical free-form surface.

14. A dispersion compensator according to Claim 1 wherein the reflecting surface on the reflecting mirror is provided with a surface which is disposed diagonally in an incident optical axis at least in a plane which includes a direction of chromatic dispersion by the angular dispersion element.

15. A dispersion compensator according to Claim 1 wherein the reflecting surface on the reflecting mirror is movable in a direction approximately orthogonal to an incident optical axis.

16. A dispersion compensator according to Claim 1 wherein the reflecting surface on the reflecting mirror is movable at least in a plane which includes a direction of chromatic dispersion by the angular dispersion element.

17. A dispersion compensator according to Claim 1 wherein the reflecting surface on the reflecting mirror is movable in a surface orthogonal to a direction of chromatic dispersion by the angular dispersion element.

18. A dispersion compensator according to Claim 1 wherein an optical surface or an optical member which has a positive power is disposed in a plane which includes at least a surface in a direction of chromatic dispersion by the angular dispersion element in an optical path between the angular dispersion element and the reflecting surface on the reflecting mirror.

19. A dispersion compensator according to Claim 18 wherein the optical surface which has a positive power in a plane which includes a direction of chromatic dispersion by the angular dispersion element is a reflecting surface made by the concave-surfaced diffracting grating.

20. A dispersion compensator according to Claim 19 wherein the reflecting surface made by the concave-surfaced diffracting grating is an anamorphic surface.

21. A dispersion compensator according to Claim 19 wherein the reflecting surface made by the concave-surfaced diffracting grating is rotatively an asymmetrical free-form surface.

22. A dispersion compensator according to Claim 18 wherein the optical member which has a positive power in a plane which includes a direction of chromatic dispersion by the angular dispersion element is a cylindrical lens which is disposed between the angular dispersion element and the reflecting mirror.

23. A dispersion compensator according to Claim 18 wherein the optical member which has a positive power in a plane which includes a direction of chromatic dispersion by the angular dispersion element is an anamorphic lens which is disposed between the angular dispersion element and the reflecting mirror.

24. A dispersion compensator according to Claim 18 wherein the optical member which has a positive power in a plane which includes a direction of chromatic dispersion by the angular dispersion element is a free-form-surfaced lens which is disposed between the angular dispersion element and the reflecting mirror.

25. A dispersion compensator according to Claim 2 wherein the optical element is an optical deflecting device which is provided with a reflecting surface which has a positive power.

26. A dispersion compensator according to Claim 25 wherein the optical deflecting device is a reflecting diffracting grating.

27. A dispersion compensator according to Claim 2 wherein the optical element is a concave-surfaced mirror having a positive power which is disposed between the angular dispersion element and the diffracting optical element.

28. A dispersion compensator according to Claim 27 wherein the concave-surfaced mirror is an anamorphic concave-surfaced mirror.

29. A dispersion compensator according to Claim 2 wherein the optical element is provided with a free-form reflecting surface which is disposed between the angular dispersion element and the diffracting optical element.
30. A dispersion compensator according to Claim 1 wherein the angular dispersion element is an interferometer.
31. A dispersion compensator according to Claim 1 wherein the angular dispersion element is a Fabry-Pérot-interferometer.
32. A dispersion compensator according to Claim wherein the angular dispersion element is an etalon.
33. A dispersion compensator according to Claim 1 wherein the angular dispersion element is a virtually-imaged-phased-array (VIPA).
34. A dispersion compensator according to Claim 1 wherein the angular dispersion element is a diffracting grating.
35. A dispersion compensator according to Claim 34 wherein the diffracting grating is provided with a surface having a blaze angle.
36. A dispersion compensator according to Claim 1 wherein the angular dispersion element is a prism.

37. A dispersion compensating system comprising:

a dispersion compensator according to Claim 1,

a signal monitor which monitors a light which is ejected from the dispersion compensator and outputs a signal which contains at least an information for a chromatic dispersion of the light or an information for a dispersion slope; and

a control device which controls a movement of the reflecting mirror such that at least a chromatic dispersion or a dispersion slope is reduced according to the signal which is outputted from the signal monitor.

38. A dispersion compensating system comprising:

a dispersion compensator according to Claim 1,

a signal monitor which monitors a light which is ejected from the dispersion compensator and outputs a signal which contains at least an information for a chromatic dispersion of the light or an information for a dispersion slope; and

a control device which controls a movement of the diffracting optical element such that at least a dispersion or a dispersion slope is reduced according to the signal which is outputted from the signal monitor.

39. A dispersion compensating system comprising:

a dispersion compensator according to Claim 3,

a signal monitor which monitors a light which is ejected from the dispersion compensator and outputs a signal which contains at least an information for a dispersion of the light or an information for a dispersion slope; and



a control device which controls a deflecting angle by the light deflecting device such that at least a dispersion or a dispersion slope is reduced according to the signal which is outputted from the signal monitor.